

REMARKS

35 USC §103(a)

Original claims 1 and 12-18 are rejected under 35 USC §103(a) as being unpatentable over Indira et al. "Chemical Polishing of Metals: A Study" pp. 80-91 in view of Kaufman (US 6,063,306). The Applicant respectfully disagrees, especially in view of the added claims presented herein.

Claim 34 recites:

"A reagent mixture for polishing a surface comprising at least one metal having a high rate of diffusion and at least one barrier layer that is mechanically hard, the mixture comprising:

a) an oxidizing reactant selected from the group consisting of H_2O_2 , HNO_3 and mixtures thereof; and

b) a co-reactant is selected from the group consisting of H_3PO_4 , H_2SO_4 , HNO_3 , oxalic acid, acetic acid, organic acids and mixtures thereof,

wherein the reagent mixture achieves about a 1:1 removal selectivity between the at least one metal and the at least one barrier layer." (emphasis added)

Kaufman clearly and explicitly teaches against a slurry solution that achieves a 1:1 removal selectivity between at least one metal with a high rate of diffusion (in this case, copper) and at least one barrier layer that is mechanically hard (in this case, tantalum) when he states in Column 3, lines 3-11:

“Current copper containing substrates that are polished using chemical mechanical polishing also use Ta and TaN adhesion layers. Ta and TaN are chemically very passive and mechanically very hard, and thus difficult to remove by polishing. The use of a single slurry, which performs with a high Cu:Ta selectivity demand prolonged polishing times for Ta, i.e. a significant overpolishing times (sic) for copper, during which there is a significant degradation of dishing and erosion performance.” (emphasis added).

The Federal Circuit has stated that “obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching, suggestion or incentive supporting the combination.” *In re Geiger*, 815 F.2d 686, 2 USPQ 2d 1276, 1278 (Fed. Cir. 1987). In addition, the Court in *W.L. Gore* stated that “In concluding that obviousness was established by the teachings in various pairs of references, the district court lost sight of the principle that there must have been something present in those teachings to suggest to one skilled in the art that the claimed invention before the court would have been obvious.” *See W.L. Gore & Assocs. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303, 311 (Fed. Cir. 1983). Further, the Federal Circuit has stated that “It is impermissible to use the claimed invention as an instruction manual or “template” to piece together the teachings of the prior art so that the claimed invention is rendered obvious. This court has previously stated that ‘one cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.’” *In re Fritch*, 972 F.2d 1260, 23 USPQ 2d 1780, 1784 (Fed. Cir. 1992) (quoting *In re Fine*, 837 F.2d 1071, 1075, 5 USPQ 2d 1596, 1600 (Fed. Cir. 1988)). A reference teaches away from the claimed subject matter if it suggests that the line of development flowing from the reference’s disclosure is unlikely to be productive of the result sought by the Applicant. *See W.L. Gore & Assocs. v. Garlock, Inc.*, 721 F.2d 1540, 1550-51, 220 USPQ 303, 311 (Fed. Cir. 1983), *cert. denied*, 469 US 851 (1984) and *In re Caldwell*, 319 F.2d 254, 256, 138 USPQ 243, 245 (CCPA 1963) (reference teaches away if it leaves the impression that the product would not have the property sought by the applicant).

The teachings of Kaufman, as shown above, are that the use of a reagent mixture that achieves a 1:1 removal selectivity to polish a Cu:Ta surface will not work – given the overpolishing

time with respect to copper and given the poor quality of the final product. Using Kaufman in combination with Indira is merely piecing together the teachings of the prior art so that the claimed invention is rendered obvious. No one of ordinary skill in the art at the time the present invention was made could have considered combining Indira and Kaufman to produce the present invention. Therefore, based on the teachings of Kaufman – shown above, one of ordinary skill in the art of CMP would not find any teaching, suggestion or motivation in Kaufman to prepare a single-step slurry solution for planarizing a surface that comprises Cu and at least one of Ta or TaN. As a matter of fact, one ordinarily skilled in the art of CMP would actually be discouraged from attempting to prepare a reagent mixture that achieves a 1:1 removal selectivity between copper and tantalum after a fair reading of Kaufman. The Applicant respectfully requests that the Examiner review and reconsider her position on this subject matter.

Claims 19-33 are rejected under 35 USC §103(a) as being unpatentable over Kaufman (US 6,063,306). The Applicant respectfully disagrees.

Claim 19 recites:

“A method of accomplishing chemical mechanical planarization of a Cu/Ta/TaN surface comprising:

providing a single-step slurry solution including a combination selected from the group consisting of (i) H₂O₂ with H₃PO₄, H₂SO₄, HNO₃, oxalic acid, acetic acid, or organic acid, (ii) HNO₃ with H₃PO₄, or H₂SO₄; and (iii) an oxidizing reagent with HF;

applying the solution to the surface; and

planarizing both the Cu and at least one of the Ta and TaN during a single processing step.”

Kaufman clearly and explicitly teaches against a single-step slurry solution when he states in

Column 3, lines 3-11:

“Current copper containing substrates that are polished using chemical mechanical polishing also use Ta and TaN adhesion layers. Ta and TaN are chemically very passive and mechanically very hard, and thus difficult to remove by polishing. **The use of a single slurry, which performs with a high Cu:Ta selectivity demand prolonged polishing times for Ta, i.e. a significant overpolishing times (sic) for copper, during which there is a significant degradation of dishing and erosion performance.**” (emphasis added).

A reference teaches away from the claimed subject matter if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the Applicant. *See* W.L. Gore & Assocs. v. Garlock, Inc., 721 F.2d 1540, 1550-51, 220 USPQ 303, 311 (Fed. Cir. 1983) (the totality of a reference's teachings must be considered), *cert. denied*, 469 US 851 (1984) and *In re Caldwell*, 319 F.2d 254, 256, 138 USPQ 243, 245 (CCPA 1963) (reference teaches away if it leaves the impression that the product would not have the property sought by the applicant).

The teachings of Kaufman, as shown above, are that the use of a single slurry to polish a Cu:Ta surface will not work – given the overpolishing time with respect to copper and given the poor quality of the final product. Therefore, based on the teachings of Kaufman – shown above, one of ordinary skill in the art of CMP would not find any teaching, suggestion or motivation in Kaufman to prepare a single-step slurry solution for planarizing a surface that comprises Cu and at least one of Ta or TaN. As a matter of fact, one ordinarily skilled in the art of CMP would actually be discouraged from attempting to prepare a single-step slurry after a fair reading of Kaufman. Further, based on this argument, among others, Kaufman should be removed as a possible cited reference against the present application and current claims set.

Furthermore, given the explicit teaching away in Kaufman from a single-step slurry, the

Applicant is perplexed at the Examiner's comments that one of ordinary skill in the art would find it obvious to use a single-step slurry in light of Kaufman. The Applicant respectfully requests that the Examiner reconsider her position on these claims before the Applicant seeks review by the Board of Appeals.

REQUEST FOR ALLOWANCE

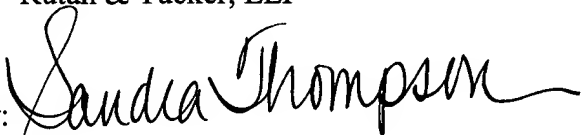
Claims 19-43 are pending in this application. The applicant requests allowance of all pending claims.

REQUEST FOR TELECONFERENCE

The undersigned Attorney-of-Record respectfully requests a teleconference with the Examiner, if the above-referenced points are still at issue in this matter, in order to resolve any remaining issues before preparation of additional Papers in this matter.

Respectfully submitted,

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